CHAPTER 5

IMPACTS ON ETHNIC AND ECONOMIC GROUPS AND COMMUNITIES

INTRODUCTION

Socioeconomic issues have become increasingly important in recent years during the development of air quality regulations and policies. Evaluation of the distribution of job and cost impacts among ethnic and economic groups, as well as geographic communities, is a key topic to be considered.

While a socioeconomic assessment provides valuable information regarding the potential direct and secondary effects, the analysis does have some limitations. Establishing appropriate methods to estimate distribution effects is difficult because the socioeconomic assessment in the air pollution area is a relatively new field. Few analytical models exist that can be easily adapted to air quality policy analysis. The lengthy data collection process makes it formidable to timely follow the rapid-changing socioeconomic characteristics, especially in Southern California. Moreover, there is an inherent bias because costs tend to be more easily measured than benefits. Finally, there are additional uncertainties associated with examining subpopulations within the four-county area. Overall, socioeconomic assessments require substantially more data than what currently exists because existing data are often limited or based on small samples, thereby making estimates less reliable.

It is not possible at this time to quantify the costs associated with every control measure or the benefits associated with every effect of clean air. Thirty-two short-term measures along with some long-term measures were quantified. Costs for the other measures are not available at this time because specific source categories, control efficiencies, emission reductions, or costs of control technologies are not presently known. The measures whose costs cannot be quantified represent 53 percent of the total emission reductions intended for the attainment demonstration.

The REMI model, used to analyze potential impacts of the Draft Final 2007 AQMP, projects possible impacts on jobs, the distribution of jobs, income, and product prices based upon the input of cost data for the quantified control measures and benefit data for each quantified effect of clean air. The reliability of such projections is dependent upon the validity of the input. District staff believes that it would be inappropriate to make assumptions relative to job impacts on ethnic groups for unquantified measures and benefits. The analysis contained herein, therefore, considers only those measures and benefits for which quantification is available. Furthermore, the job and other socioeconomic impacts from control measures and clean air are presented separately due to the relatively large size of emission reductions from unquantified measures. These impacts should not be summed since the clean air benefits were based on all the emission reductions intended for attainment, while the costs were based on only the quantifiable measures.

CLEAN AIR BENEFITS BY SUB-REGION

The four-county area is projected to attain the federal $PM_{2.5}$ standard in 2014 and the federal ozone standard in 2023. Air quality benefits mostly occur throughout the Basin. The eastern portion of Los Angeles County and the Chino-Redlands area are projected to have the highest shares of quantified air quality benefits. The quantified health benefits from reductions in $PM_{2.5}$ are expected to reach nearly $9.1 billion in 2014 and $9.3 billion

annually, on average, from 2007 to 2025. When compared with the baseline "no control" scenario, the central and eastern portions of Los Angeles County and the Chino-Redlands area show the greatest reduction in $PM_{2.5}$ and hence the greatest health benefit. Northern Los Angeles County, the non-urbanized Riverside County, and San Bernardino County will also benefit from reductions in ozone. Eighty-eight percent of the agricultural benefit congregates in the non-urbanized Riverside County (Table 5-1). The majority of the congestion relief benefit would be attributed to the eastern portion (the San Gabriel Valley) of Los Angeles County and southern Orange County.

TABLE 5-1

Average Annual Benefits (2007-2025) by Sub-region

	Ozone		$PM_{2.5}$		Agriculture		Congestion		Material		Visibility		Total	
Sub-region	MM$	%	MM$	%	MM$	%	MM$	%	MM$	%	MM$	%	MM$	%
LA CO Burbank	-1	1%	309	3%	0	0%	30	3%	8	4%	216	6%	562	4%
LA CO San Fernando	-7	7%	616	7%	0	0%	66	7%	15	8%	218	6%	910	6%
LA CO West	-25	27%	673	7%	0	0%	60	6%	15	7%	655	18%	1378	10%
LA CO Central	-18	20%	915	10%	0	0%	60	6%	16	8%	247	7%	1219	9%
LA CO South Central	-12	13%	475	5%	0	0%	36	4%	10	5%	-11	0%	498	4%
LA CO South	-5	6%	442	5%	0	0%	51	5%	11	5%	144	4%	643	5%
LA CO East	-6	7%	1257	14%	0	0%	96	10%	18	9%	351	10%	1716	12%
LA CO Southeast	-8	9%	687	7%	0	0%	61	6%	12	6%	73	2%	825	6%
LA CO Island	0	0%	0	0%	0	0%	0	0%	0	0%	1	0%	1	0%
LA CO Beach	-3	3%	287	3%	0	0%	24	3%	8	4%	269	7%	587	4%
LA CO North	2	-2%	39	0%	0	1%	38	4%	6	3%	66	2%	152	1%
Orange CO North	-3	4%	266	3%	0	0%	31	3%	6	3%	124	3%	423	3%
Orange CO Central	-9	10%	472	5%	0	0%	59	6%	11	6%	39	1%	573	4%
Orange CO South	-1	1%	368	4%	1	7%	75	8%	12	6%	429	12%	884	6%
Orange CO West	-3	3%	321	3%	0	-1%	36	4%	10	5%	278	8%	642	5%
Northwest Riverside	-1	1%	648	7%	0	3%	63	7%	11	5%	154	4%	876	6%
Other Riverside	3	-3%	391	4%	16	88%	71	7%	16	8%	129	4%	626	4%
Chino-Redlands	4	-5%	1071	12%	0	2%	101	10%	12	6%	216	6%	1406	10%
Other San Bernardino	2	-2%	58	1%	0	1%	7	1%	5	2%	30	1%	103	1%
Total	-90	100%	9,294	100%	18	100%	966	100%	204	100%	3,631	100%	14,023	100%

The west portion of Los Angeles County is projected to have the highest share of the visibility aesthetic benefit, which is calculated based on the number of households, visibility improvements (compared to the “no control” baseline scenario), net household income (net of housing cost), and percent of college degree holders in each sub-region. Table 5-2 shows the values of these variables by sub-region based on the 2000 Census. In 2014, the southern and central Los Angeles County is projected to have the highest visibility improvement relative to its baseline air quality (18.9%) among all the sub-regions. In 2020, the western and seaside Los Angeles County would show the highest visibility improvement (29% and 28.2% from its baseline air quality, respectively).

Information on net household income and percent of college degree holders for the benchmark years 2014 and 2020 is not available. The annual growth rates of net household

income and percent of college degree holders, respectively, between the 1990 and 2000 Census in each sub-region were used to project the values of these variables for those benchmark years. Additionally, SCAG household projections were used. The total willingness to pay for visibility improvement is higher in the sub-regions with more relative improvements in visibility and denser population due to their higher net household income and percentage of college degree holders.

TABLE 5-2
Determining Factors for Aesthetic Visibility Benefit by Sub-region

Sub-region	Households	Net Household Income	% College Degree	% Visibility Improvement	
		1995 $		2014	2020
LA CO Burbank	214,768	$40,682	34	17.2	22.9
LA CO San Fernando	401,319	37,141	24	16.8	23.5
LA CO West	381,637	53,335	51	16.8	29.0
LA CO Central	418,719	22,030	21	18.9	24.9
LA CO South Central	270,100	20,468	7	14.8	22.2
LA CO South	288,061	33,365	21	18.9	30.3
LA CO East	464,470	40,849	24	18.2	24.5
LA CO Southeast	317,450	32,501	13	15.8	23.4
LA CO Island	1,281	31,826	21	13.4	19.3
LA CO Beach	214,644	48,933	37	16.2	28.2
LA CO North	161,325	44,048	21	12.2	16.1
Orange CO North	135,372	50,701	33	17.2	27.6
Orange CO Central	267,466	36,707	15	16.8	26.4
Orange CO South	289,000	61,594	44	17.2	28.0
Orange CO West	243,449	53,642	35	16.5	27.8
Northwest Riverside	199,707	38,903	17	16.5	27.1
Other Riverside	301,474	35,572	17	15.4	21.1
Chino-Redlands	375,585	36,102	17	15.2	23.1
Other San Bernardino	149,043	32,252	14	10.3	14.6

The health and agricultural benefits were calculated at the 5 kilometer by 5 kilometer grid level and aggregated to the 19 sub-region level using the air quality projections from the Comprehensive Air Quality Model with Extensions (CAMx) model. The visibility benefit analysis was performed at the 19 sub-region level by aggregating the predicted $PM_{2.5}$ concentration data for each grid and the total light extinction coefficient at the nearest airport for each grid to 19 sub-regions. The congestion relief benefit was assessed by aggregating the reductions in VMT and VHT at the air quality grid level to 19 sub-regions. The assessment of material benefit was performed at the county level and allocated to sub-regions according to their population and housing units within a county. All the assessments were first made for the benchmark years (2009, 2012, 2020, and 2023 for ozone; and 2014 and 2020 for $PM_{2.5}$) in the air quality models and interpolated for interim years.

COSTS BY SUB-REGION

The Draft Final 2007 AQMP requires emission reductions from stationary, area, on-road, and off-road sources. Emission reductions from stationary sources consist of those from permitted (point) and non-permitted (area) sources. Projected emission reductions in 2023 from area sources were assigned to a 5 kilometer by 5 kilometer grid and those from point sources were assigned to a census tract for each quantified measure. The emission reductions for each quantified measure in each grid or census tract were then aggregated to a total of 19 sub-regions. The annual cost for each quantified measure (annualized capital and annual operating and maintenance expenditures) during the implementation period was then allocated to each sub-region according to its proportion of emission reductions.

The cost of SCAG TCMs will be financed by private and public funding. The private funding was allocated to the designated sectors according to the location of projects. The public funding was first allocated to each county according to the tax burden of each county and then to each sub-region according to its population share in the county. For area, on-road, and off-road sources, the annual cost of each control measure was allocated to each sub-region according to its share of emission reductions, which was aggregated from emission reductions at air quality grids.

As described in Chapter 3, the average annual cost of all quantified measures from 2007 to 2025 is projected to be $1.98 billion. Table 5-3 shows the projected cost share in each sub-region for all the quantified control measures by implementation jurisdiction. The southern and seaside Los Angeles County is projected to have the highest share (55% combined) of the cost for those measures that would be implemented by the District. This is mainly due to Control Measures CMB-02 (RECLAIM SOx Reductions) and FLX-02 (Petroleum Refinery Pilot Program). The southern portion of Los Angeles County where the harbors and airports are located would share 24 percent of the cost under the CARB mobile strategy. The Chino-Redlands area would have the highest share of the cost related to the District's mobile control measures. The central Los Angeles County has the highest share of the SCAG TCM cost. For all the quantified control measures as a whole, the southern portion of Los Angeles County would have a 19 percent share of the total cost, followed by the Chino-Redlands area and the eastern Los Angeles County (8% each).

TABLE 5-3
Cost Share by Jurisdiction by Sub-region for Quantified Measures

Sub-region	District Stationary & Area		CARB Mobile		District Mobile		SCAG		Total	
	Millions $	%	Millions $	%	Millions $	%	Millions $	%	Millions $	%
LA CO Burbank	$3	2%	$23	2%	$12	3%	$21	5%	$59	3%
LA CO San Fernando	7	4%	48	5%	23	6%	30	7%	107	5%
LA CO West	4	2%	43	4%	25	7%	24	6%	97	5%
LA CO Central	4	2%	47	5%	23	6%	47	11%	122	6%
LA CO South Central	4	2%	28	3%	15	4%	25	6%	71	4%
LA CO South	62	35%	236	24%	32	8%	39	9%	368	19%
LA CO East	9	5%	70	7%	34	9%	39	9%	152	8%
LA CO Southeast	8	4%	49	5%	25	6%	27	6%	108	5%
LA CO Island	0	0%	0	0%	0	0%	9	2%	9	0%
LA CO Beach	36	20%	24	2%	14	4%	19	4%	93	5%
LA CO North	2	1%	43	4%	16	4%	18	4%	78	4%
Orange CO North	3	2%	22	2%	12	3%	11	3%	48	2%
Orange CO Central	5	3%	41	4%	24	6%	23	5%	93	5%
Orange CO South	5	3%	47	5%	25	6%	19	4%	95	5%
Orange CO West	4	2%	74	7%	17	4%	23	5%	118	6%
Northwest Riverside	7	4%	45	5%	20	5%	18	4%	90	5%
Other Riverside	5	3%	54	5%	22	6%	11	3%	92	5%
Chino-Redlands	12	7%	82	8%	42	11%	21	5%	157	8%
Other San Bernardino	1	0%	12	1%	5	1%	6	1%	24	1%
Total	$179	100%	$988	100%	$385	100%	$430	100%	$1,982	100%

JOB IMPACTS BY SUB-REGION

The total projected employment for Los Angeles County is 5.8 million jobs in 2014 and 6.02 million in 2023 without the Draft Final 2007 AQMP. Orange County is projected to have 2.24 million jobs in 2014 and 2.39 million in 2023. Riverside and San Bernardino Counties are projected to have 1.11 and 1.06 million jobs in 2014 and 1.34 and 1.23 million jobs in 2023, respectively.

The distribution of job impacts (Table 5-4) by sub-region very much mirrors that of quantified benefits and costs. The eastern portion of Los Angeles County, the Chino-Redlands area of San Bernardino County, and northwestern portion of Riverside County are projected to have more jobs created than other sub-regions resulting from quantified clean air benefits. In terms of the job impact of quantified control measures, the majority of the jobs forgone are also in the eastern portion of Los Angeles County and the Chino-Redlands area of San Bernardino County.

TABLE 5-4
Job Impacts by Sub-region for Quantified Benefits and Quantified Measures

	Quantified Benefits			Quantified Control Measures		
Sub-region	2014	2023	Average (2007-2025)	2014	2023	Average (2007-2025)
LA CO Burbank	1611	4703	2420	-1029	-1993	-999
LA CO San Fernando	2326	6706	3467	-1919	-3219	-1526
LA CO West	2693	8673	4324	-1666	-3376	-1784
LA CO Central	2675	7725	3989	-1836	-3442	-1774
LA CO South Central	1092	3002	1573	-714	-1912	-1001
LA CO South	1851	5323	2751	1076	-3356	-1113
LA CO East	4160	12052	6211	-2884	-5319	-3048
LA CO Southeast	1878	5644	2865	-812	-3441	-1509
LA CO Island	6	19	9	-54	-75	-58
LA CO Beach	1458	4630	2316	-945	-2385	-1287
LA CO North	755	2103	1099	-1318	-1876	-1150
Orange CO North	1235	3703	1888	-774	-1801	-935
Orange CO Central	2080	5718	3011	-1306	-3482	-1740
Orange CO South	2603	7851	4002	-2167	-3864	-2078
Orange CO West	2009	6019	3074	-83	-2734	-1076
Northwest Riverside	3350	11122	5488	-1839	-3299	-1663
Other Riverside	3519	9931	5204	-2204	-3443	-2267
Chino-Redlands	3904	13101	6418	-2883	-5060	-2693
Other San Bernardino	536	1870	902	-414	-852	-503
Total	**39,742**	**119,900**	**61,014**	**-23,770**	**-54,929**	**-28,204**

JOB IMPACTS BY RACE AND ETHNICITY

The job impacts discussed in this report represent the net change to the employment trend of an industry. This net change includes a mixture of new hires, layoffs/attrition from the existing work force, and a slowdown in projected job growth. When new hires are greater than layoffs, or attrition more jobs will be created. When the reverse is true, there will be jobs forgone. Much of the near-term impacts may be generated through a combination of forgone growth and layoffs. The impacts in the more distant future tend to be deviations from projected job growth. A dynamic economy must undergo such changes in order to grow and adjust to new conditions. These changes can increase productivity and promote greater competitiveness. Furthermore, these changes in the context of the Draft Final 2007 AQMP, are necessary to improve the environment, which generates enormous benefits for the public.

Tables 5-5 and 5-6 show the distribution of job impacts by industry and ethnicity for quantifiable clean air benefits and control measures, respectively. Between 2007 and 2025, it is projected that an average of 61,014 jobs would be created annually resulting from the clean air benefit alone. Based on the 2000 Census data, Whites would have an overall 45 percent share of the average annual jobs gained, followed by Hispanics (33.6 percent), Asians (11.3 percent), and African Americans (6.6 percent). However, the percentages of

shares of job gains do vary across industries, as shown in Table 2-1 of Chapter 2. Given the rapidly-changing structure of population and workforce in the four-county area, significant uncertainty exists in projecting the job distribution by race and ethnicity.

The same race and ethnicity distribution or workforce by industry from the 2000 Census was applied to job impacts of quantified measures. Table 5-6 shows that, from 2007 to 2025, quantified control measures are projected to have 28,204 jobs forgone annually, on average. The manufacturing sector is projected to have a slight job gain and Hispanics would have the highest share of this gain.

TABLE 5-5
Average Annual Job Impacts by Ethnicity by Industry for Quantified Clean Air Benefit

Industry	White	Hispanic	Asian	Black	Others	More than one Race	Total
Agri. & Farming	79	173	9	3	4	4	272
Construction	2719	2645	209	163	71	131	5938
Manufacturing	1521	2099	578	147	48	78	4470
Transportation, Warehousing & Utilities	2536	2090	607	814	92	155	6293
Wholesale	637	571	217	49	14	28	1516
Retail	2229	1719	573	275	61	154	5011
Finance, Ins., & Real Estate	2984	1182	712	352	46	141	5417
Information	469	138	73	63	7	21	770
Services	10,611	7118	2692	1676	254	569	22,921
Government	7253	3386	1338	2351	202	373	14,903
Grand Total	**27,472**	**20,501**	**6880**	**4015**	**677**	**1469**	**61,014**

TABLE 5-6
Average Annual Job Impacts by Ethnicity by Industry for Quantified Measures

Industry	White	Hispanic	Asian	Black	Others	More than one Race	Total
Agri. & Farming	0	-1	0	0	0	0	-1
Construction	-127	-123	-10	-8	-3	-6	-277
Manufacturing	46	64	18	4	1	2	136
Transportation, Warehousing & Utilities	-362	-298	-87	-116	-13	-22	-898
Wholesale	10	9	4	1	0	0	25
Retail	-1441	-1111	-370	-178	-39	-100	-3239
Finance, Ins., & Real Estate	-1467	-581	-350	-173	-22	-69	-2663
Information	-256	-75	-40	-34	-4	-12	-421
Services	-4331	-2905	-1099	-684	-104	-232	-9355
Government	-5587	-2608	-1031	-1811	-156	-287	-11,480
Grand Total	**-12,699**	**-9,477**	**-3,180**	**-1,856**	**-313**	**-679**	**-28,204**

JOB IMPACTS ON HIGH- VERSUS LOW-PAYING JOBS

Occupations were grouped into five categories, lowest to highest, according to median weekly earnings. Table 5-7 shows the distribution of job impacts in 2014 and 2023 resulting from quantified clean air benefits and control measures, respectively, among various occupational wage groups. All the groups are projected to gain from cleaner air. Groups 3 and 4 would gain the most in 2014 and 2023. For quantified control measures, all the groups would have jobs forgone ranging from 0.43 percent to 0.6 percent relative to the baseline 2023 employment, with Group 4 to be affected the most. Group 3 occupations include workers in construction trades, auto mechanics, and counselors. Group 4 occupations include workers in law enforcement, education, finance and business operations, and media and communications. The occupations in each group are listed in Table B-1 of Appendix B.

TABLE 5-7
Employment Impacts by Occupational Wage Group for
Quantified Clean Air Benefits and Quantified Measures

Group	Median Weekly Earnings	No. of Occupations	% Impact from Baseline			
			Clean Air Benefits		Control Measures	
			2014	2023	2014	2023
1	$321-$421	19	0.39%	1.01%	-0.29%	-0.49%
2	$440-$587	19	0.35%	1.01%	-0.14%	-0.43%
3	$594-$696	18	0.39%	1.15%	-0.17%	-0.51%
4	$705-$845	20	0.49%	1.34%	-0.38%	-0.60%
5	$884-$1,560	18	0.40%	1.10%	-0.16%	-0.44%

IMPACTS ON DISPOSABLE INCOME

Without the Draft Final 2007 AQMP, real disposable income is projected to grow at an annual rate of 2.528 percent between 2007 and 2025.[1] Quantified clean air benefits of the Draft Final AQMP could increase the annual growth rate to 2.605 percent. Per capita real disposable income (total real disposable income divided by population) would decrease by $580 in 2025 relative to the baseline projection. On the other hand, the quantified measures would lower the projected growth rate of the real disposable income from 2.528 to 2.501 percent annually. This would result in a decrease in per capita real disposable income by $58 in 2025.

The decrease in per capita disposable income from cleaner air is because of the higher growth rate of population than that of total real disposable income. The annual population growth rate from 2007 to 2025 is projected to be 1.131 percent with clean air benefits alone as opposed to the baseline annual growth rate of 0.971 percent. Implementation of quantified control measures is projected to lower the annual population growth rate to 0.949 percent relative to the 0.971 percent baseline rate.

[1] The real disposable income for the four county area is projected to be $515 billion (2000 dollars) in 2007 and $807 billion in 2025. Disposable income is the sum of the incomes of all the individuals in the economy after all taxes have been deducted (Baumol and Blinder, 1982).

IMPACTS ON PRICE INDEX BY INCOME

The REMI model develops price indexes of consumption goods for households in five income groups by comparing prices of those goods between the four-county region and the rest of the United States. Table 5-8 shows the projected percentage change in the price of consumption goods (those goods identified in the annual Consumer Expenditure Survey by the Bureau of Labor Statistics) by income group for quantified clean air benefits and control measures, respectively, in the years 2014 and 2023.

The change here is relative to the baseline index of consumption goods. The price of consumption goods is projected to decrease by 0.07 percent in 2014 across all household income groups and by 0.17 to 0.18 percent in 2023 due to the attainment of the clean air standards. Implementation of quantified control measures is projected to increase the price of consumption goods from 0.12 to 0.16 percent for these same years across all household income groups. The projected increase in the price is due to the pass-through of additional control costs by industries that are affected by a number of control measures.

TABLE 5-8
Impacts on the Price of Consumption Goods for
Quantified Clean Air Benefits and Quantified Measures
(percent of baseline)

	Clean Air Benefits		Control Measures	
Household Income	2014	2023	2014	2023
1st Quintile	-0.07%	-0.17%	0.14%	0.16%
2nd Quintile	-0.07%	-0.18%	0.13%	0.16%
3rd Quintile	-0.07%	-0.18%	0.13%	0.15%
4th Quintile	-0.07%	-0.18%	0.12%	0.15%
5th Quintile	-0.07%	-0.17%	0.12%	0.15%

SUMMARY

Implementation of the Draft Final 2007 AQMP is projected to result in air quality improvements sufficient to attain the federal air quality standards in 2014 for $PM_{2.5}$ and in 2023 for ozone. The eastern portion of Los Angeles County and the Chino-Redlands area are projected to have the highest shares of quantified air quality benefits. The air quality modeling results have shown that the greatest $PM_{2.5}$ improvements are in the central and eastern Los Angeles County and Chino-Redlands area of San Bernardino County. Northern Los Angeles County, the non-urbanized Riverside County, and San Bernardino County will benefit from reductions in ozone.

The attainment of the ozone and $PM_{2.5}$ air quality standards depends on full implementation of control measures that are proposed in the Draft Final 2007 AQMP. The costs of these measures will ripple throughout various communities. Quantified control measures would impose relatively greater share of costs on the southern portion of Los Angeles County than the rest of the communities. This is because of the significant costs incurred by several mobile source control measures located in the ports of southern Los Angeles County.

All the 19 sub-regions are projected to have additional jobs created from cleaner air. All ethnic groups are expected to have job gains, as a result. Conversely, implementation of quantified control measures would result in jobs forgone between 2007 and 2025. Because of their large representation in today's workforce, Whites and Hispanics will be affected most by changes in jobs. However, significant uncertainty exists in projecting the job distribution by race and ethnicity due to the rapidly-changing structure of population and workforce in the four-county area.

Job gains from cleaner air would benefit all five wage groups comprised of 94 occupations. Conversely, all five groups would experience jobs forgone from quantified control measures. However, there is no significant difference in impacts expected for high- versus low-paying jobs. The same is observed for impacts on the price of consumption goods from one income group to another. These findings require further evaluation during individual rule development efforts.

Implementation of the unquantified measures could result in employment impacts on ethnic groups. However, a detailed analysis cannot be performed on unquantified measures until they are fully quantified relative to their costs. The distribution of job impacts on ethnic groups resulting from quantified measures and benefits needs to be further explored with the use of additional and more recent data. District staff will further examine these issues in future rule development efforts.

Additional surveys on affected groups and communities need to be developed to better understand the detailed job impacts. Furthermore, additional tools need to be developed relative to presenting socioeconomic and air quality data geographically. Chapter 8 has a more detailed description of these proposed future enhancements to the socioeconomic analysis.